

### Listing of Claims

1. (Currently Amended) An apparatus, comprising:  
a fluidic Micro Electro-Mechanical System (MEMS) ~~that is formed~~  
~~including comprising~~ a polymer layer ~~and joined to~~ a substrate portion, the polymer  
layer of the apparatus comprising:  
a containment portion that in combination with the substrate ~~encloses~~  
defines a fluidic channel, wherein the containment portion includes a deep  
cross-linked polymer region and a shallow cross-linked polymer region,  
and  
wherein the deep cross-linked polymer region and the shallow cross-  
linked polymer region of the containment portion are formed as a unitary  
structure.
2. (Original) The apparatus of claim 1, further comprising a resistor located in,  
on, or adjacent to the substrate.
3. (Original) The apparatus of claim 1, wherein a portion of the containment  
portion that does not contact the substrate includes a shallow cross-linked polymer  
region and a portion of the containment portion that contacts the substrate includes  
a deep cross-linked polymer region.
4. (Currently Amended) The apparatus of claim 3, wherein portions of the  
containment portion that includes the shallow cross-linked polymer region are on  
lateral sides of the fluidic ~~channel;~~channel.

1 5. (Original) The apparatus of claim 3, wherein portions of the containment  
2 portion that includes the deep cross-linked polymer region are separated by the  
3 fluidic channel from the substrate.

4 6. (Original) The apparatus of claim 1, wherein the apparatus acts as a pump.

5  
6 7. (Original) The apparatus of claim 1, wherein the apparatus acts as a  
7 polymerase chain reaction (PCR) reactor.

8  
9 8. (Original) The apparatus of claim 1, wherein the apparatus acts as a  
10 separator.

11 9. (Original) The apparatus of claim 1, wherein the apparatus acts as an optical  
12 waveguide.

13  
14 10. (Original) The apparatus of claim 1, wherein the apparatus acts as a filter.

15  
16 11. (Original) The apparatus of claim 1, wherein the deep cross-linked polymer  
17 region and the shallow cross-linked polymer region are produced using direct  
18 imaging techniques.

19  
20 12. (Original) The apparatus of claim 1, wherein the deep cross-linked polymer  
21 region and the shallow cross-linked polymer region are produced using lost wax  
22 techniques.  
23  
24  
25

1 **13.** (Original) The apparatus of claim 1, wherein the deep cross-linked polymer  
2 region and the shallow cross-linked polymer region are produced using dry film  
3 techniques.

4 **14.** (Withdrawn) A method of making a fluidic Micro Electro-Mechanical  
5 System (MEMS) on a substrate, comprising:

6 depositing a polymer material to form a polymer layer on the substrate; and  
7 hardening portions of the polymer layer to create a containment portion  
8 from a shallow cross-linked polymer region and a deep cross-linked polymer  
9 region, wherein the shallow cross-linked polymer region and the deep cross-linked  
10 polymer region of the containment portion are formed as a unitary structure.

11 **15.** (Withdrawn) The method of claim 14, wherein at least a portion of the  
12 fluidic MEMS acts as a pump.

13  
14 **16.** (Withdrawn) The method of claim 14, wherein at least a portion of the  
15 fluidic MEMS acts as a polymerase chain reaction (PCR) reactor.

16  
17 **17.** (Withdrawn) The method of claim 14, wherein at least a portion of the  
18 fluidic MEMS acts as a separator.

19  
20 **18.** (Withdrawn) The method of claim 14, wherein at least a portion of the  
21 fluidic MEMS acts as an optical waveguide.

22 **19.** (Withdrawn) The method of claim 14, wherein at least a portion of the  
23 fluidic MEMS acts as a filter.  
24  
25

1     **20.**   (Withdrawn) The method of claim 14, further comprising locating a  
2     resistor within, of adjacent to, the substrate.

3     **21.**   (Withdrawn) The method of claim 14, further comprising spinning the  
4     deposited polymer material to make the polymer layer more planar.

5  
6     **22.**   (Withdrawn) The method of claim 14, wherein certain portions of the  
7     containment portion are fabricated using a strong exposure cross-linking process,  
8     while other portions of the containment portion are fabricated using a weak  
9     exposure cross-linking process.

10    **23.**   (Withdrawn) The method of claim 14, wherein the method includes direct  
11    imaging techniques.

12  
13    **24.**   (Withdrawn) The method of claim 14, wherein the method includes lost  
14    wax techniques.

15  
16    **25.**   (Withdrawn) The method of claim 14, wherein the method includes dry  
17    film techniques.

18  
19    **26.**   (Withdrawn) A method of making a pump on a substrate, comprising:  
20        depositing a polymer material on the substrate to create a polymer layer;  
21        and  
22        hardening portions of the polymer layer to create a first check valve, a  
23        second check valve, and a containment portion from the polymer material,  
24        wherein the first check valve, the second check valve, and the containment portion  
25        are formed as a unitary structure.

1 27. (Withdrawn) The method of claim 26, further comprising forming a  
2 recessed portion in the substrate that corresponds to each of the first check valve  
3 and the second check valve.

4 28. (Withdrawn) The method of claim 26, further comprising spinning the  
5 deposited polymer material to make the polymer layer more planar.

6  
7 29. (Withdrawn) The method of claim 26, further comprising creating a  
8 resistor in the substrate, for forming a bubble to create a pressure differential.

9  
10 30. (Withdrawn) The method of claim 26, wherein the first check valve and the  
11 second check valve are created using a strong exposure cross-linking process.

12 31. (Withdrawn) The method of claim 26, wherein certain portions of the  
13 containment portion are fabricated using a strong exposure process, while other  
14 portions of the containment portion are fabricated using a weak exposure cross-  
15 linking process.

16  
17 32. (Withdrawn) A pump apparatus formed including a polymer layer and a  
18 substrate portion, the polymer layer of the pump apparatus comprising:

19 a first check valve including a deep cross-linked polymer region;  
20 a second check valve including a deep cross-linked polymer region;  
21 a containment portion that in combination with the substrate encloses a  
22 fluidic channel; and

23 wherein the first check valve, the second check valve, and the containment  
24 portion are formed in the polymer layer as a unitary structure.  
25

1 **33.** (Withdrawn) An integrated total chemical analysis system that is fabricated  
2 on a substrate using a direct imaging process, further comprising:

3 a portion of the deep cross-linked polymer region that defines lateral fluid  
4 boundaries of the integrated total chemical analysis system; and

5 a shallow cross-linked polymer region for defining upper fluid boundaries  
6 of the integrated total chemical analysis system, wherein the deep cross-linked  
7 polymer region and the shallow cross-linked polymer region form a unitary  
8 structure.

9 **34.** (Withdrawn) The integrated total chemical analysis system of claim 33,  
10 that includes at least two devices from the group of a filter, a pump, a waveguide,  
11 a polymerase chain reaction (PCR) reactor, and a separator.

12 **35.** (Withdrawn) The integrated total chemical analysis system of claim 33,  
13 wherein the deep cross-linked polymer region is cross-linked using a strong direct  
14 imaging exposure process.

15 **36.** (Withdrawn) The integrated total chemical analysis system of claim 33,  
16 wherein the shallow cross-linked polymer region is cross-linked using a weak  
17 direct imaging exposure process.

18 **37.** (Withdrawn) The integrated total chemical analysis system of claim 33,  
19 wherein the integrated total chemical analysis system includes a fluidic micro  
20 electro-mechanical system (MEM) device.  
21  
22  
23  
24  
25

1 **38.** (Withdrawn) A method comprising:

2 fabricating using a single process a fluidic micro electro-mechanical system  
3 (MEMS) device on a polymer layer deposited on a substrate, the fabricating the  
4 fluidic MEMS device includes:

5 defining lateral fluid boundaries of the fluidic MEMS device using a strong  
6 direct imaging exposure process; and

7 defining upper fluid boundaries of the fluidic MEMS device using a weak  
8 direct imaging exposure process.

9 **39.** (Withdrawn) The method of claim 38, further comprising filtering fluid  
10 with the fluidic MEMS.

11  
12 **40.** (Withdrawn) The method of claim 38, further comprising heating fluid  
13 with the fluidic MEMS.

14  
15 **41.** (Withdrawn) The method of claim 38, further comprising separating fluid  
16 with the fluidic MEMS.

17  
18 **42.** (Withdrawn) The method of claim 38, further comprising optically  
19 detecting material in a fluid using the fluidic MEMS.

20 **43.** (Withdrawn) The method of claim 38, further comprising pumping fluid  
21 with the fluidic MEMS.

1 **44.** (Withdrawn) A method of making a reactor on a substrate, comprising:  
2 forming at least one heating element within, or proximate to, the substrate;  
3 depositing a polymer material on the substrate that creates a polymer layer;  
4 and

5 hardening portions of the polymer layer to create a containment portion,  
6 wherein the containment portion is formed as a unitary structure.

7  
8 **45.** (Withdrawn) The method of claim 44, further comprising spinning the  
9 deposited polymer material to make the polymer layer more planar.

10 **46.** (Withdrawn) The method of claim 44, wherein the first check valve and the  
11 second check valve are created using a strong exposure cross-linking process.

12  
13 **47.** (Withdrawn) The method of claim 44, wherein certain portions of the  
14 polymer layer are fabricated using a strong exposure process, while other portions  
15 of the polymer layer are fabricated using a weak exposure cross-linking process.

16  
17 **48.** (Withdrawn) A reactor apparatus formed including a polymer layer portion  
18 and a substrate portion, the polymer layer portion of the reactor apparatus  
19 comprising:

20 a containment portion that in combination with the substrate encloses a  
21 fluidic channel;

22 a portion of at least one heating element that is applied to at least a portion  
23 of the fluidic channel;

24 wherein the containment portion are formed in the polymer layer as a  
25 unitary structure; and



1 wherein certain portions of the containment portion are fabricated using a  
2 strong exposure process, while other portions of the containment portion are  
3 fabricated using a weak exposure cross-linking process.

4 **49.** (Withdrawn) A method of making a separator on a substrate, comprising:  
5 depositing a polymer material on the substrate to form a polymer layer;  
6 forming a controllable electric potential source relative to the polymer  
7 layer; and

8 hardening portions of the polymer layer to create a containment portion,  
9 wherein the containment portion is formed as a unitary structure.

10 **50.** (Withdrawn) The method of claim 49, further comprising spinning the  
11 deposited polymer material to make the polymer layer more planar.

12  
13 **51.** (Withdrawn) The method of claim 49, wherein the separator utilizes  
14 electrophoresis to separate particles.

15  
16 **52.** (Withdrawn) The method of claim 49, wherein certain portions of the  
17 containment portion are fabricated using a strong exposure process, while other  
18 portions of the containment portion are fabricated using a weak exposure cross-  
19 linking process.

20 **53.** (Withdrawn) A separator apparatus formed including a polymer layer and a  
21 substrate portion, the polymer layer of the separator apparatus comprising:

22 a containment portion that in combination with the substrate encloses a  
23 fluidic channel, wherein the containment portion is formed in the polymer layer as  
24 a unitary structure.  
25

1 **54.** (Withdrawn) A method of making a filter including a plurality of filter  
2 elements on a substrate, comprising:

3        depositing a polymer material on the substrate to form a polymer layer; and  
4        hardening portions of the polymer layer to create the plurality of filter  
5 elements and a containment portion from the polymer layer, wherein the plurality  
6 of filter elements and the containment portion are formed as a unitary structure.

7 **55.** (Withdrawn) The method of claim 54, further comprising spinning the  
8 deposited polymer material to make the polymer layer more planar.

9 **56.** (Withdrawn) The method of claim 54, wherein the plurality of filter  
10 elements are created using a strong exposure cross-linking process.

11  
12 **57.** (Withdrawn) The method of claim 54, wherein certain portions of the  
13 containment portion are fabricated using a strong exposure process, while other  
14 portions of the containment portion are fabricated using a weak exposure cross-  
15 linking process.

16  
17 **58.** (Withdrawn) A filter apparatus formed including a polymer layer and a  
18 substrate portion, the polymer layer of the filter apparatus comprising:

19        a plurality of filter elements including a deep cross-linked polymer region;  
20        a containment portion that in combination with the substrate encloses a  
21 fluidic channel; and

22        wherein the plurality of filter elements and the containment portion are  
23 formed in the polymer layer as a unitary structure.  
24  
25

1  
2 **59.** (Withdrawn) A method of making an optical waveguide on a substrate,  
3 comprising:

4        depositing a polymer material on the substrate to form a polymer layer; and  
5        hardening portions of the polymer layer to create an input optical conduit, a  
6 focusing lens, and a containment portion from the polymer layer, wherein the  
7 input optical conduit, the focusing lens, and the containment portion are formed as  
8 a unitary structure.

9 **60.** (Withdrawn) The method of claim 59, further comprising spinning the  
10 deposited polymer material to make the polymer layer more planar.

11 **61.** (Withdrawn) The method of claim 59, wherein the input optical conduit  
12 and the focusing lens are at least partially created using a strong exposure cross-  
13 linking process.

14  
15 **62.** (Withdrawn) The method of claim 59, wherein certain portions of the  
16 containment portion are fabricated using a strong exposure process, while other  
17 portions of the containment portion are fabricated using a weak exposure cross-  
18 linking process.

19  
20 **63.** (Withdrawn) A waveguide apparatus formed including a polymer layer and  
21 a substrate portion, the polymer layer of the waveguide apparatus comprising:

22        an input optical conduit including a deep cross-linked polymer region;  
23        a focusing lens including a deep cross-linked polymer region;  
24        a containment portion that in combination with the substrate encloses a  
25 fluidic channel; and

1 wherein the input optical conduit, the focusing lens, and the containment  
2 portion are formed in the polymer layer as a unitary structure.

3 **64.** (Withdrawn) A method comprising:

4 depositing a structural material layer that defines the lateral boundaries of at  
5 least one fluidic channel of a fluidic micro electromechanical system (MEMS)  
6 device; and

7 laminating a dry film layer on the deposited structural material to at least  
8 partially define an upper layer that of the at least one fluid channel.

9 **65.** (Withdrawn) A method comprising:

10 depositing a sacrificial material on a substrate;

11 depositing a polymer layer on the substrate and the sacrificial material; and

12 removing the sacrificial material to at least partially define boundaries of at  
13 least one fluidic channel of a fluidic micro electromechanical system (MEM)  
14 device, the at least one fluidic channel is at least partially defined by a portion of  
15 the polymer layer and a portion of the substrate.

16 **66.** (Withdrawn) An anchor apparatus, comprising:

17 a deep cross-linked polymer region;

18 a shallow cross-linked polymer region supported by the deep cross-linked  
19 polymer region, the shallow cross-linked polymer region having a thru-hole  
20 formed therein, wherein the deep cross-linked polymer region and the shallow  
21 cross-linked polymer region are attached; and

22 a connector portion that secures to the thru-hole, wherein the top-hat  
23 structure enhances the attachment of the connector to the thru-hole.  
24  
25

1     **67.**     (Withdrawn) The anchor apparatus of claim 66, further comprising glue to  
2     secure the connector portion to the thru-hole.

3     **68.**     (Withdrawn) The anchor apparatus of claim 67, wherein the shallow cross-  
4     linked polymer region forms an overhang portion, wherein the glue is affixed to  
5     the overhang portion in a manner to enhance the attachment of the connector to the  
6     thru-hole.

7  
8     **69.**     (Withdrawn) The anchor apparatus of claim 66, further comprising epoxy  
9     to secure the connector portion to the thru-hole.

10    **70.**     (Withdrawn) The anchor apparatus of claim 66, wherein the deep cross-  
11    linked polymer region and the shallow cross-linked polymer region form a top-hat  
12    structure.  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25